REMARKS/ARGUMENTS

The Pending Claims

Claims 1-21 currently are pending. Claims 1-17 are directed toward a polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a negative Poisson's ratio. Claims 18-21 are directed toward a method of polishing with the aforementioned polishing pad. Reconsideration of the claims is respectfully requested.

Summary of the Office Action

The Office Action maintains the grounds of rejection affirmed by the Decision on Appeal, dated January 26, 2011, which are as follows:

(a) Claims 1-7 and 16-20 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt (i.e., U.S. Patent 6,095,902) in combination with Lakes (i.e., U.S. Patent 4,668,557) and Furukawa et al. (i.e., WO 03/058698 A1 (U.S. Patent Publication 2005/0107007 A1 as English language equivalent));

(b) Claims 8 and 10 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Sevilla et al. (i.e., U.S. Patent 6,126,532);

(c) Claim 9 stands rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Suzuki et al. (i.e., U.S. Patent 6,120,353);

(d) Claims 11-13 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Osterheld et al. (i.e., U.S. Patent 6,241,596); and

(e) Claims 14, 15, and 21 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Tang (i.e., U.S. Patent 5,949,927).

Discussion of the Obviousness Rejections

The Office Action maintains the rejection of all of the pending claims as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. alone or in further combination with Sevilla et al., Suzuki et al., Osterheld et al., or Tang. All of the pending claims require, *inter alia*, a chemical-mechanical polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0, i.e., a negative Poisson's ratio. Each of the rejections based on Reinhardt, Lakes and Furukawa et al., alone and in further combination with other references, was addressed in detail in Applicants' "Supplemental Reply to Office Action," dated June 22, 2011, and in "Appellants' Appeal Brief," dated April 29, 2008.

Applicants maintain that it would not have been obvious to a person of ordinary skill in the art, nor would it have been a matter of routine experimentation, to develop a polishing pad comprising a porous polymeric material having a negative Poisson's ratio. As such, Applicants respectfully submit that the reasoning of the Decision on Appeal, and the reasoning maintained by the Office Action, is improper (see Decision on Appeal, p. 8, reasoning that "a person of ordinary skill in the art (see Fact 2) would readily appreciate the teachings of Lakes and could routinely experiment to develop a polishing pad, such as taught in Reinhardt, with a negative Poisson's ratio material since Reinhardt is silent on the Poisson's ratio and does not appear to discourage the use of a negative Poisson's ratio material"; see also Office Action, p. 3, reasoning that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the conventional polyurethane foam of the Reinhardt polishing pad with polyurethane foam having a Poisson's ration [*sic*, ratio] below zero, to improve strength and abrasion resistance, which are well known in the art as desired properties of polishing pads").

First, the Office Action and the Decision on Appeal reason that Reinhardt discloses porous polishing pads made by foaming (Office Action, p. 2; see also Decision on Appeal, p. 4 ¶ 3, p. 5 ¶ 8, p. 7), but each fails to acknowledge that Reinhardt contemplates the use of both porous *and nonporous* polishing pads comprising polyurethanes (see, e.g., col. 1, lines 29-33). Reinhardt does not disclose any benefits of foamed or porous polishing pads as compared to nonporous polishing pads. Thus, a person of ordinary skill in the art, in view of

the disclosure of Reinhardt, would not have had a reason to select a porous polishing pad instead of a nonporous polishing pad. Indeed, a person of ordinary skill in the art also considering the disclosure of Furukawa et al. – which the Office Action relies upon for its purported teaching that "superior strength and abrasion resistance are desired" properties of polishing pads (Office Action, p. 3) – would have had a reason to select a nonporous polishing pad. In particular, Furukawa teaches against the use of foamed, porous polishing pads, as follows:

> As the polishing pads that utilize resins having a closed cell structure, polishing pads comprising foaming polyurethane are known. Said polishing pads are manufactured in a process in which block-like urethane foams are produced in a batch type reaction and then said block-like foams are sliced into a sheet form. Since said polishing pads have hemispheric recesses (in an order of few dozen μm) derived from sliced air bubbles as local concave-convex structures, they are usually used with concave-convex structures covering the entire surface of the pad such as grooves formed by cutting operations.
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> However, since it is difficult to secure uniformity in reaction temperature and uniformity in foaming factor throughout the entire reaction vessel in the production of said polishing pads, it is difficult to produce products that are uniform throughout the polishing pads. Also since slurry components or products generated during polishing tend to precipitate in the above hemispheric recesses in said pads, they have a drawback of clogging by precipitates in a relatively short period of time. Thus, in order to maintain a high polishing speed, it is necessary to remove the clogged region on the surface of the polishing pad with the dresser frequently. Thus, they have-problems that long dressing time in a total during polishing is required and that the polishing pad has a short life. **Thus, the polishing pads comprising such polyurethane foams have not always satisfied the above three requirements for the polishing pad (thus, a high polishing speed, abrasion resistance, planarizing ability).**

(paragraphs 0011-0012 (emphasis added); see also paragraphs 0025, 0030). Each of the pending claims, by contrast, requires a chemical-mechanical polishing pad comprising a porous polymeric material.

Second, the Office Action reasons that "Reinhardt fails to disclose that the porous polymeric material has a Poisson's ration [*sic*, ratio] less than zero" (Office Action, p. 2). Similarly, the Decision on Appeal reasons that Reinhardt is "silent as to the Poisson's ratio"

(Decision on Appeal, p. 4 ¶ 4), and that the material disclosed by Reinhardt "falls into one of three ranges: positive, zero, or negative" (Decision on Appeal, p. 7). Contrary to the reasoning of the Office Action and Decision on Appeal, however, Reinhardt discloses porous polymeric materials having *only a positive Poisson's ratio*, as all known porous polymeric materials have a positive Poisson's ratio unless they are specially treated so as to convert them into a material having a negative Poisson's ratio (see "Declaration Under 37 C.F.R. § 1.132 of Abaneshwar Prasad" ("Prasad Declaration"), filed June 22, 2011, ¶ 4). None of the materials disclosed in Reinhardt is a porous polymeric material having a negative Poisson's ratio. Nor does Reinhardt provide a person of ordinary skill in the art with any reason to modify the positive Poisson's ratio of the materials disclosed therein – Reinhardt does not so much as mention the *existence* of Poisson's ratios, let alone recognize the impact of Poisson's ratios on polishing pad materials.

Third, the Office Action reasons that Lakes "teaches that the negative Poisson's ration [*sic*, ratio] polymeric foams can replace polymeric foams having positive Poisson's ratios in many applications to provide improved properties" (Office Action, p. 2; see also Decision on Appeal, p. 7). However, Lakes does not teach or suggest the use of negative Poisson ratio materials in chemical-mechanical polishing applications. Nor does Lakes provide a person of ordinary skill in the art with a reason to modify the porous polymeric foam of Reinhardt to obtain a porous polymeric material having a negative Poisson's ratio (see Office Action, p. 3; see also Decision on Appeal, pp. 7-8). On the contrary, Applicants maintain that the triaxial compression and high temperature conditions necessary to convert a porous polymeric material having a positive Poisson's ratio to a porous polymeric material having a negative Poisson's ratio are not consistent with conventional processes for making polishing pads that were known at the time of the claimed invention (see Prasad Declaration, ¶ 6). The Office Action states that "[a]lthough known processes [to make chemical-mechanical polishing pads] do not include steps necessary to provide a negative Poisson's ratio, the Lakes reference very clearly sets forth methods necessary to create polymeric materials having a negative Poisson's [ratio]" (Office Action, p. 8). Applicants respectfully submit that the Office Action misses the point of Applicants' argument. While Applicants agree that Lakes sets forth a procedure for the conversion of a positive Poisson's ratio material to a negative Poisson's ratio material, that procedure is so far removed from – and entirely inconsistent with – traditional, known methods to make chemical-mechanical polishing pads that a person

of ordinary skill in the art would not have had a reason to use the conditions set forth in Lakes in the manufacture of a polishing pad, let alone have had a reasonable expectation that the application of the conditions set forth in Lakes would successfully produce a polishing pad (see Prasad Declaration, ¶ 6).

In addition, there were numerous procedures already known in the art to improve pad strength and abrasion resistance properties (see Prasad Declaration, ¶ 7). Thus, a person of ordinary skill in the art would not consider the use of a negative Poisson's ratio material to improve abrasion resistance, especially in view of the unconventional process conditions required to make a negative Poisson's ratio material. Moreover, even if a person of ordinary skill in the art would have had a reason to utilize a porous polymeric material modified to have a negative Poisson's ratio in the polishing pad of Reinhardt, he or she would not have known whether the material would provide the appropriate level of abrasion resistance needed for good polishing activity in any particular polishing application (Prasad Declaration, ¶ 8).

Fourth, it would not have been a matter of routine experimentation to convert a positive Poisson's ratio material to a negative Poisson's ratio material for use in the polishing pad of Reinhardt. The application of triaxial compression and high temperature conditions to many conventional polishing pads (e.g., polishing pads comprising non-porous solid polymeric materials) would not necessarily produce a negative Poisson's ratio material, because the materials utilized in the polishing pad may not possess the special characteristics that allow porous polymeric materials to be compressed in each of the three dimensions (see Prasad Declaration, ¶ 6). Thus, contrary to the reasoning of the Office Action, it would not have been obvious that – let alone necessarily true that – "the polyether polyurethane foam of Reinhardt [would] have [had] very similar properties to a polyester foam and once treated using the method of Lakes would have [had] a Poisson's ratio similar to that of the treated polyester foam example of Lakes" (Office Action, p. 3).

Fifth, and as described in detail in Applicants' Supplemental Reply to Office Action dated June 22, 2011, there are several unexpected, beneficial results attendant the claimed invention that confirm its patentability. Namely, a greater durability and less deformation than other polishing pads when subjected to stresses, such as those imposed during polishing;

a self-cleaning property, which increases pad durability and pad life; and a balance between compliance and rigidity that distributes concentrated force without compression, which reduces "edge-on" effects that occur during polishing (see Supplemental Reply to Office Action, June 22, 2011, p. 6; Prasad Declaration, ¶¶ 9-15). The Office Action fails to acknowledge these unexpected benefits of the claimed invention.

None of Reinhardt, Lakes, or Furukawa et al. provides a credible reason for one of ordinary skill in the art to have selected a porous polishing pad, nor to have utilized a negative Poisson's ratio material in a porous polishing pad, let alone to have had a reasonable expectation of success in doing so. Nor do the cited references provide any basis for one of ordinary skill in the art to have reasonably concluded that a polishing pad comprising a porous polymeric material having a negative Poisson's ratio would provide the beneficial properties reported in the present application and the Prasad Declaration.

For the reasons discussed previously, each of Sevilla et al., Suzuki et al., Osterheld et al., and Tang fails to cure the deficiencies of Reinhardt, Lakes, and Furukawa et al. vis-à-vis the pending claims (see Applicants' Appeal Brief, April 29, 2008, pp. 6-9).

In view of the foregoing, Applicants respectfully submit that the obviousness rejections are improper and should be withdrawn.

Conclusion

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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